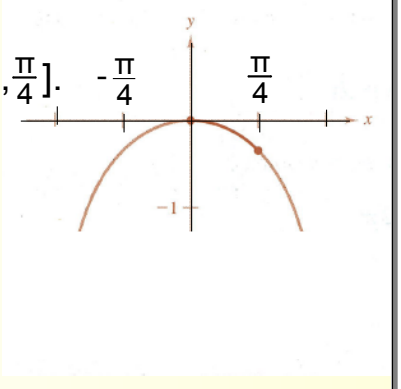
Calculus Warm Up # 9-3

Evaluate:

1. $\int_0^{\pi/4} \sqrt{1 + \tan^2 x}\, dx$

2. Find the arc length on $[0, \frac{\pi}{4}]$.

$y = \ln(\cos x)$



HW Questions: p. 456 day 2

3. $\int (1 - \csc t \cot t)\, dt$

4. $\int (\theta^2 + \sec^2 \theta)\, d\theta$

5. $\int (\sec^2 \theta - \sin \theta)\, d\theta$

6. $\int \sec y(\tan y - \sec y)\, dy$

11. $\int \sec^2 \frac{x}{2}\, dx$

13. $\int \frac{\csc^2 x}{\cot^3 x}\, dx$

$u = \cot x$

$du = -\csc^2 x\, dx$

15. $\int \cot^2 x\, dx = \int (\csc^2 x - 1)\, dx$

17. $\int (\tan x)^4 \sec^2 x\, dx \Rightarrow$

$u = \tan x$

$du = \sec^2 x\, dx$

$\int u^{-3}\, du$

$\frac{u^{-2}}{-2}$

19. $\int \cot \pi x\, dx$

23. $\int \frac{\sec^2 x}{\tan x}\, dx$

25. $\int \frac{\sec x \tan x}{\sec x - 1}\, dx$

$u = \sec x - 1$

$du = \sec x \tan x\, dx$

39. $\int_{\pi/2}^{2\pi/3} \sec^2 \frac{x}{2}\, dx$

41. $\frac{1}{2}\int_{\pi/12}^{\pi/4} 2\csc 2x \cot 2x\, dx$

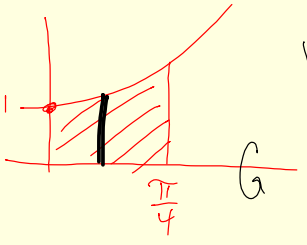
$u = 2x$

$du = 2\,dx$

43. $\int_0^1 \sec(1-x)\tan(1-x)\, dx$

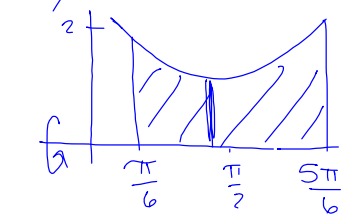
In Exercises 51–54, find the volume of the solid generated by revolving the region bounded by the graphs of the given equations about the x-axis.

53. $y = \sec x,\ y = 0,\ x = 0,\ x = \pi/4$



$V = \pi\int_0^{\pi/4} \sec^2 x\, dx$

54)



$$V = \pi \int_{\pi/6}^{5\pi/6} \csc^2 x \, dx$$

Chapter 9: Integration Techniques

9.1 Fitting Integrands to the basic formulas

1) Using Algebra
2) Creating du by: add & subtract or multiply and divide
3) Recognizing u & du (may be disguised!)

1) Using Algebra

Split the quotient: $\int \frac{1+\cos(e^{-2x})}{e^{2x}}\,dx$

Do the division: $\int \frac{x^2+4}{x-1}\,dx$

Expand: $\int (x+4)^3\,dx$

1) Using Algebra

Split the quotient: $\int \frac{1+\cos(e^{-2x})}{e^{2x}}\,dx$

$$\int e^{-2x}\,dx + \int \frac{\cos(e^{-2x})}{e^{2x}}\,dx \qquad u = e^{-2x},\ du = -\frac{2}{e^{2x}}$$

$$= -\frac{1}{2}e^{-2x} - \frac{1}{2}\int \cos(e^{-2x})\left(-\frac{2}{e^{2x}}\,dx\right)$$

$$= -\frac{1}{2}e^{-2x} - \frac{1}{2}\sin(e^{-2x}) + C$$

1) Using Algebra

Do the division: $\int \frac{x^2+4}{x-1}\,dx$

$$1 \;\big|\; 1 \quad 0 \quad 4$$
$$\qquad\quad 1 \quad 1$$
$$\qquad 1 \quad 1 \quad 5$$

$$= \int \left(x + 1 + \frac{5}{x-1}\right) dx$$

$$= \frac{x^2}{2} + x + 5\ln|x-1| + C$$

1) Using Algebra

Expand: $\int (x+4)^3\,dx$

$$\int \left(x^3 + 3x^2(4) + 3x(4)^2 + 4^3\right) dx$$

$$\int \left(x^3 + 12x^2 + 48x + 64\right) dx$$

$$\frac{x^4}{4} + 4x^3 + 24x^2 + 64x + C$$

2) Creating du by: add & subtract or multiply and divide

$$\int \frac{1}{1+e^x}\,dx$$

$u = 1 + e^x$

$du = e^x\,dx$

✱ Need e^x in numerator

$$\int \frac{(1+e^x) - e^x}{1+e^x}\,dx$$

$$\int \frac{1+e^x}{1+e^x}\,dx - \int \frac{e^x}{1+e^x}\,dx$$

$$x - \int \frac{1}{u}\,du$$

$$x - \ln(1+e^x) + C$$

3) u & du in disguise...

$$\int \underbrace{\cot x}_{du}\,\underbrace{[\ln(\sin x)]}_{u}\,dx$$

$u = \ln(\sin x)$

$du = \frac{1}{\sin x} \cdot \cos x$

$du = \cot x$

☺

Classwork:

8.6 Integrals involving inverse trigonometric functions

Blue worksheet

HW: p. 497, # 1 - 23 odd,

41 - 45 odd, 51 - 55 odd

Week 8 HW Quiz tomorrow:

pgs. 399, 404, 415, salmon WS